

REMARKS

The Examiner is thanked for the performance of a thorough search.

By this amendment, Claims 1-22 have been cancelled and Claims 23-39 have been added. Hence, Claims 23-39 are pending in this application. All issues raised in the Office Action mailed April 4, 2006 are addressed hereinafter.

CLAIM OBJECTIONS HAVE BEEN OVERCOME

The Office Action objected to Claims 11-22 for “failing to observe proper claim numbering conventions.” As a practical matter, it is noted that this objection has been rendered moot, as Claims 11-22 are cancelled by this amendment.

New Claims 23-39 follow proper claim numbering conventions.

CLAIMS 23-39 ARE DIRECTED TO STATUTORY SUBJECT MATTER

As Claims 1-22 have been cancelled, the rejection of Claims 1-22 made under 35 U.S.C. § 112, second paragraph, for allegedly being directed to non-statutory subject matter has been rendered moot.

It is respectfully submitted that Claims 23-39 are directed to statutory subject matter. Claims 23-39 claim a method¹. A method is a process, which is expressly recognized as being patentable subject matter under 35 U.S.C. § 101.

¹ While Claims 23-39 recite the phrase “transmission media” within the preamble, this does not change the fact that Claims 23-39 are directed towards a method, and are not directed towards either “transmission media” in general or a “signal” in the abstract.

To be statutory under 35 U.S.C. § 101, the result of a claim must be useful, tangible, and concrete. With the exception of the requirement that the result of the invention be tangible, Applicants are not aware of any other tangibility requirement relating to 35 U.S.C. § 101. The Patent Office is invited to identify any legal authority that supports the position that 35 U.S.C. § 101 includes a requirement that an embodiment of the invention be tangible².

The result of each of Claims 23-39 is useful, as Claims 23-39 are directed towards performing a frequent itemset operation. Performing a frequent itemset operation is useful for the reasons described in the Applicants' specification. The result of each of Claims 23-39 is tangible, as the result of performing a frequent itemset operation may be perceived by a human. The result of each of Claims 23-39 is concrete, as the result of performing a frequent itemset operation may be reproduced.

Consequently, for at least the above reasons, it is respectfully submitted that Claims 23-39 are directed towards statutory subject matter. If the Office disagrees, the Office is invited to particular identify the legal authority that supports the position that Claims 23-39 are not directed towards statutory subject matter. It is also noted that the Office has issued numerous patents that include at least one claim with the same preamble as recited by the independent claims in the present application, such as U.S. Patents 7,051,080, 7,047,252, and 7,024,656.

THE PENDING CLAIMS ARE PATENTABLE OVER THE CITED ART

Claims 1-22 have been cancelled herein, and so it is respectfully submitted that the rejections to Claims 1-22 made under 35 U.S.C. §§ 102(b) and 103(a) have been rendered moot.

²For example, 35 U.S.C. § 101 states that a process is one of the four statutory classes of patentable subject matter, but yet a process is not tangible. Therefore, it is clearly incorrect to say that an invention must be tangible to qualify as patentable subject matter.

For the reasons explained hereinafter, each of the pending claims recites at least one element that is not disclosed, taught, or suggested by U.S. Patent No. 6,324,533 issued to Agrawal et al. ("*Agrawal*") or *High Performance Mining of Maximal Frequent Itemsets*, by Gosta Grahne and Jianfei Zhu ("*Grahne*").

CLAIMS 23-29

Claim 23 recites:

“dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques by performing the steps of:
generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated I/O cost of using the available occurrence counting technique, and
selecting the occurrence counting technique that has the lowest estimated cost; and
during said frequent itemset operation, using said selected occurrence counting technique to count occurrences of at least one combination to determine whether said at least one combination satisfies frequency criteria associated with said frequent itemset operation.” (emphasis added)

At least the above-bolded portions of Claim 23 are not disclosed, taught, or suggested by *Agrawal* or *Grahne*, either individually or in combination.

Claim 23 is directed towards an approach for performing a frequent itemset operation. According to the approach of Claim 23, a selected occurrence counting technique is dynamically selected from a plurality of available occurrence counting techniques. To select an occurrence counting technique, cost estimates for each of the plurality of available occurrence counting techniques are generated. The cost estimates are based on an estimated I/O cost of using the available occurrence counting technique. For example, the occurrence counting technique that has the lowest estimated cost may be selected. During the frequent itemset operation, the selected occurrence counting technique is used to count occurrences of at least one combination

to determine whether the combination satisfies frequency criteria associated with the frequent itemset operation

On the other hand, while *Agrawal* describes an approach for performing a frequent itemset operation, *Agrawal* lacks any teaching or suggestion of anything analogous to generating cost estimates for each of a plurality of available occurrence counting techniques based on an estimated I/O cost of using the available occurrence counting technique. As a result, several elements of Claim 23 are not shown by *Agrawal*.

To illustrate, Claim 23 recites the element of “generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated I/O cost of using the available occurrence counting technique.” *Agrawal* does discuss criteria for choosing the best SQL-OR approach (see Col. 11, line 37- Col. 12, line 30); however, there are significant differences between the teaching of *Agrawal* and the requirements of this element. For example, *Agrawal* does not choose the best SQL-OR approach based on an estimated I/O cost of using an available occurrence counting technique. Instead, the cost analysis performed by *Agrawal* involves examining “data characteristics like the number of items, total number of transactions, and average length of a transaction” (See Col. 11, lines 38-40). Examining characteristics of the data is not analogous to estimating the I/O cost of using an available occurrence counting technique because on different machines the same data characteristics may have different I/O costs. As a result, the concepts are orthogonal. Therefore, *Agrawal* cannot disclose, teach, or suggest this element.

Similarly, *Grahne* also lacks any teaching or suggestion of this element. Thus, the combination of *Agrawal* and *Grahne* would still fail to teach or suggest this element.

As at least one element is not disclosed, taught, or suggested by *Grahne* or *Agrawal*, either individually or in combination, it is respectfully submitted that Claim 23 is patentable over the cited art and is in condition for allowance.

Claims 24-29 all depend from Claim 23, and therefore, include all of the limitations of Claim 23. It is therefore respectfully submitted that Claims 24-29 are patentable over the cited art for at least the reasons set forth herein with respect to Claim 23. Furthermore, it is respectfully submitted that Claims 24-29 recite additional limitations that independently render them patentable over the cited art.

For example, Claims 25 recites the element of “generating an I/O cost estimate for a prefix tree technique based, at least in part, on a size of the candidate prefix tree and an amount of memory that can be used to store the candidate prefix tree.” No cited art reference suggests the performance of this step.

As another example, Claim 27 recites “generating an I/O cost estimate for a bitmap intersection technique based, at least in part, on a cost of reading bitmaps for each frequent item.” No cited art reference suggests the performance of this step.

As a further example, Claim 29 recites “determining that a particular occurrence counting technique will not be considered during any phase of the frequent itemset operation; and performing the frequent itemset operation without performing startup operations for said particular occurrence counting technique.” No cited art reference suggests the performance of this step. For example, the portion of *Agrawal* previously cited to show this subject matter (Col. 11, lines 40-44) lacks any suggestion of (a) a particular occurrence counting technique that will not be considered during any phase of a frequent itemset operation or (b) performing a frequent

itemset operation without performing startup operations for a particular occurrence counting technique.

CLAIMS 30-36

Claim 30 recites:

“dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques by performing the steps of:
generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated CPU cost of using the available occurrence counting technique, and
selecting the occurrence counting technique that has the lowest estimated cost; and
during said frequent itemset operation, using said selected occurrence counting technique to count occurrences of at least one combination to determine whether said at least one combination satisfies frequency criteria associated with said frequent itemset operation.” (emphasis added)

At least the above-bolded portions of Claim 30 are not disclosed, taught, or suggested by *Agrawal* or *Grahne*, either individually or in combination.

Claim 30 is directed towards an approach for performing a frequent itemset operation. According to the approach of Claim 30, a selected occurrence counting technique is dynamically selected from a plurality of available occurrence counting techniques. To select an occurrence counting technique, cost estimates for each of the plurality of available occurrence counting techniques are generated. The cost estimates are based on an estimated CPU cost of using the available occurrence counting technique. For example, with all other factors equal, the occurrence counting technique that has the lowest estimated cost may be selected. During the frequent itemset operation, the selected occurrence counting technique is used to count occurrences of at least one combination to determine whether the combination satisfies frequency criteria associated with the frequent itemset operation

On the other hand, while *Agrawal* describes an approach for performing a frequent itemset operation, *Agrawal* lacks any teaching or suggestion of anything analogous to generating cost estimates for each of a plurality of available occurrence counting techniques based on an estimated CPU cost of using the available occurrence counting technique. As a result, several elements of Claim 30 are not shown by *Agrawal*.

To illustrate, Claim 30 recites the element of “generating cost estimates for each of the plurality of available occurrence counting techniques based on an estimated CPU cost of using the available occurrence counting technique.” *Agrawal* does discuss criteria for choosing the best SQL-OR approach (see Col. 11, line 37- Col. 12, line 30); however, there are significant differences between the teaching of *Agrawal* and the requirements of this element. For example, *Agrawal* does not choose the best SQL-OR approach based on an estimated CPU cost of using an available occurrence counting technique. Instead, the cost analysis performed by *Agrawal* involves examining “data characteristics like the number of items, total number of transactions, and average length of a transaction” (See Col. 11, lines 38-40). Examining characteristics of the data is not analogous to estimating the CPU cost of using an available occurrence counting technique because on different machines the same data characteristics may have different CPU costs. As a result, the concepts are orthogonal. Therefore, *Agrawal* cannot disclose, teach, or suggest this element.

Similarly, *Grahne* also lacks any teaching or suggestion of this element. Thus, the combination of *Agrawal* and *Grahne* would still fail to teach or suggest this element.

As at least one element is not disclosed, taught, or suggested by *Grahne* or *Agrawal*, either individually or in combination, it is respectfully submitted that Claim 30 is patentable over the cited art and is in condition for allowance.

Claims 31-36 all depend from Claim 30, and therefore, include all of the limitations of Claim 30. It is therefore respectfully submitted that Claims 31-36 are patentable over the cited art for at least the reasons set forth herein with respect to Claim 30. Furthermore, it is respectfully submitted that Claims 31-36 recite additional limitations that independently render them patentable over the cited art.

For example, Claims 32 recites the element of “generating a CPU cost estimate for a prefix tree technique based, at least in part, on a cost for creating a prefix tree and a total number of item groups.” No cited art reference suggests the performance of this step.

As another example, Claim 34 recites “generating a CPU cost estimate for a bitmap intersection technique based, at least in part, on a number of candidate item groups and an intersection cost for two bitmaps.” No cited art reference suggests the performance of this step.

As a further example, Claim 36 recites “determining that a particular occurrence counting technique will not be considered during any phase of the frequent itemset operation; and performing the frequent itemset operation without performing startup operations for said particular occurrence counting technique.” No cited art reference suggests the performance of this step. For example, the portion of *Agrawal* previously cited to show this subject matter (Col. 11, lines 40-44) lacks any suggestion of (a) a particular occurrence counting technique that will not be considered during any phase of a frequent itemset operation or (b) performing a frequent itemset operation without performing startup operations for a particular occurrence counting technique.

CLAIMS 37-39

Claim 37 recites:

“dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques based on conditions existing in a computing environment in which the frequent itemset operation is to be performed, wherein the conditions include one or more of (a) workload of a computer system executing the frequent itemset operation, and (b) resources available on said computer system; and during said frequent itemset operation, using said selected occurrence counting technique to count occurrences of at least one combination to determine whether said at least one combination satisfies frequency criteria associated with said frequent itemset operation.” (emphasis added)

At least the above-bolded portions of Claim 37 are not disclosed, taught, or suggested by *Agrawal* or *Grahne*, either individually or in combination.

Claim 37 recites the element of “dynamically selecting which occurrence counting technique to use from a plurality of available occurrence counting techniques based on conditions existing in a computing environment in which the frequent itemset operation is to be performed, wherein the conditions include one or more of (a) workload of a computer system executing the frequent itemset operation, and (b) resources available on said computer system.”

The portion of *Agrawal* (Col. 11, lines 17-33 and Col. 12, lines 21-32) cited to show this element (which was previously recited in Claim 10) does discuss criteria for choosing the best SQL-OR approach. These criteria involve examining “data characteristics like the number of items, total number of transactions, and average length of a transaction” (See Col. 11, lines 38-40). Indeed, the entire teaching of *Agrawal* is centered upon examining the characteristics of the data in choosing the best SQL-OR approach, and does not consider any factor. In sharp contrast, Claim 37 requires that the occurrence counting technique is selected “based on conditions existing in a computing environment in which the frequent itemset operation is to be performed.” *Agrawal* lacks any teaching or suggestion of considering conditions existing in a computing

environment in which the frequent itemset operation is to be performed. Moreover, Claim 37 specifies what those conditions include, namely that the conditions include one or more of (a) workload of a computer system executing the frequent itemset operation, and (b) resources available on said computer system. These requirements are also not disclosed, taught, or suggested by *Agrawal*. Consequently, the above-bolded elements cannot be shown by *Agrawal*.

As at least one element is not disclosed, taught, or suggested by *Grahne* or *Agrawal*, either individually or in combination, it is respectfully submitted that Claim 37 is patentable over the cited art and is in condition for allowance.

Claims 38-39 all depend from Claim 37, and therefore, include all of the limitations of Claim 37. It is therefore respectfully submitted that Claims 38-39 are patentable over the cited art for at least the reasons set forth herein with respect to Claim 37. Furthermore, it is respectfully submitted that Claims 38-39 recite additional limitations that independently render them patentable over the cited art. However, in view of the fundamental differences already identified between Claims 38-39 and the cited art, separate arguments explaining the differences between those additional limitations recited in Claims 38-39 and the cited art will not be presented herein.

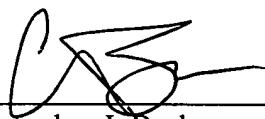
CONCLUSION

It is respectfully submitted that all of the pending claims are in condition for allowance and the issuance of a notice of allowance is respectfully requested. If there are any additional charges, please charge them to Deposit Account No. 50-1302.

The Examiner is invited to contact the undersigned by telephone if the Examiner believes that such contact would be helpful in furthering the prosecution of this application.

Respectfully submitted,

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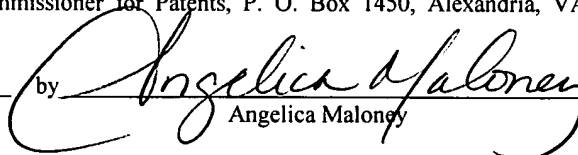
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on July 5, 2006

by


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